

Barnacles from deep-sea Telegraph Cables in the Malay Archipelago.

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Many years ago Capt. F. Worsley of the S. S. 'Sherard Osborne' obtained a number of deep-sea barnacles from cables that his ship was engaged in repairing. Some of these he presented to the Indian Museum in Calcutta, the others (the major part) to the Raffles Museum in Singapore. Those in the Indian Museum were described by me in 1905 in the *Memoirs of the Asiatic Society of Bengal*; I have now to thank Dr. Hanitsch for the opportunity of examining those in Singapore and of comparing selected specimens with the collection in Calcutta.

There is one slight uncertainty as to the *provenance* of the Singapore specimens. A large portion of them are stated to have been found in lat. $10^{\circ} 22' 30''$, but it is not stated whether North or South. There can, however, be little real doubt that South is meant, for the corresponding specimens in Calcutta are labelled "Bali Straits."

The majority of the specimens are from Bali and Gasper Straits and the Java Sea. There is also one species from off Timor. Probably all were brought up from depths of between 60 and 200 fathoms, except *Heteralepas malaysiana*, the type-specimen of which came from 30 fathoms.

A remarkable feature of the collection is the very large proportion of otherwise unknown forms represented in it. In the following list those species that are recorded also from other sources are distinguished by a star at the end of their names.

List of the Pedunculate Barnacles from Telegraph Cables in the Malay Archipelago.

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| <i>Scalpellum (Smilium) nudipes</i> ,
sp. nov. | <i>Scalpellum stearnsi</i> ,* Pilsbry. |
| <i>Scalpellum sociabile</i> ,* Annandale. | <i>Scalpellum persona</i> , sp. nov. |
| <i>Scalpellum hamulus</i> ,* Hoek. | <i>Heteralepas gigas</i> (Annandale). |
| <i>Scalpellum sociabile</i> var. <i>parvi-</i>
<i>ceps</i> , var. nov. | <i>Heteralepas (Paralepas) malay-</i>
<i>siana</i> (Annandale). |
| | <i>Poecilasma (Glyptelasma) gigas</i> , sp. nov. |

Thus, of nine forms, six, or two-thirds, are only known from a small series of less than a hundred specimens. This is the more remarkable from the fact that some eighty species of bottom-haunting Cirripedia Pedunculata were represented in the collection made by the Dutch 'Siboga' Expedition in the seas of the Malay Archipelago.

Now the greater part of the sea-bottom is soft, buried in deep ooze; and fixed sessile organisms must often have great difficulty in finding solid objects to which to attach themselves on settling down in life. To such organisms a telegraph cable is a godsend. A scientific expedition, no matter how well equipped, may dredge over the sea-bottom for thousands of miles and discover no nidus so favourable. Deep-sea Cirripedes are usually fixed to the more solid parts of other organisms such as the anchor-fibres of Hexactinellid sponges like *Hyalonema* or the stems of colonial Coelenterates. These organisms grow anchored in the ooze. The surface of attachment is, however, small. Other favourite bases for deep-sea barnacles are the manganese nodules that form themselves round bodies such as the teeth of dead sharks, the solid ear-bones of whales, and cinders dropped from passing ships. But even these, if the vast area of the sea-bottom be considered, must be scanty upon it. When the larvae of a barnacle, produced as they are in hundreds if not thousands simultaneously, chance on a cable at the moment of fixation, it is evident that a much larger proportion of them will survive than would otherwise be the case. A large number of the species of the group known from depths greater than 100 fathoms are only known at most from a few isolated specimens. One species (*Scalpellum albatrossianum*, Pilsbry) only exists so far as museums are concerned in two individuals, one of which was dredged by the 'Albatross' in the north Atlantic from 2045 fathoms, the other by the 'Investigator' in the Bay of Bengal from 1997 fathoms. Two-thirds of the species in Capt. Worsley's collection are, however, represented by series of ten or more specimens each.

The barnacles are not only remarkable for their abundance but also for their large size. Only one of the species (*Heteralepas malaysiana*) can be called a small one, while no less than three of the nine species are, each in its own genus, the largest known, namely *Scalpellum stearnsi*, *Poecilasma gigas*¹ and *Heteralepas gigas*. *S. persona* is also among the most bulky of the Pedunculata. Moreover, the type-specimen of *S. inerme* (= *S. stearnsi*), found by Capt. Worsley on a cable in Bali Straits, is the largest individual of its species as yet recorded, while the examples of *S. hamulus* from cables are twice the size of those found attached to small objects by the 'Siboga' at about the same depth.

1. In *P. subcarinatum* (Pilsbry) from the Atlantic the capitulum is at least as big but the peduncle is shorter.

It is strange to find a barnacle such as *Heteralepas gigas* on the sea-bottom in comparatively deep water, for it has all the appearance of a pelagic form. The specimens in the Raffles Museum, however, were undoubtedly attached to a telegraph cable, as is proved by an examination of the material adhering to their bases. They have been preserved in alcohol for many years and are now dull and formless objects, shrivelled out of all resemblance to their natural form, but much less uniformly contracted than the type-specimen. In life they were in all probability even larger than they are now and their integument must have been smooth, transparent and swollen; they must have borne a close external resemblance to the true *Alepas*, which is found on the surface, as a rule depending from the bells of medusae (see *Rec. Ind. Mus.*, X, p. 276, pl. xxxiii, fig. 2).

Both *Scalpellum stearnsi* and *S. persona*, which are not closely allied species, display a tendency to get rid of the calcareous valves or plates on the capitulum and to substitute for them a homogeneous cartilaginous or thick membranous investment. In all families of the true Cirripedia Pedunculata a similar tendency occurs and re-occurs in certain genera and species. It may be correlated either with a deep-sea or a pelagic existence or with semi-parasitic habits and therefore affords a rare instance of parallel evolution in which convergence is connected not with similar but with diverse modes of life. In the genus *Scalpellum* itself we find two if not three different manifestations of this curious tendency, which may perhaps be regarded as an ultimate reversion to a primitive condition. In the first place we may note a number of species of comparatively small size (e.g. *S. laccadivicum*, Annandale = *S. polymorphum*, Hoek, and *S. larvale*, Pilsbry) with compressed capitula and very delicate valves in which there is great variation in the development of these plates. Even when they are most degenerate the membrane that covers them is not thick. In some cases individuals are known in which the greater part or the whole of the capitular surface is covered by the valves, while others occur in which the valves are reduced by an excavation of their lower margins until (as in *S. lambda*, Annandale) they may all have a form approaching to that of the Greek letter λ . In such forms the valves of the young are, at any rate in some species, more complete than those of the adults. At the other extreme we find a little group of very large species such as *S. giganteum*, *S. persona* and *S. alcockianum*, with stout, more or less inflated capitula and with relatively thick valves almost completely concealed beneath a thick cartilaginous investment. In such species the condition of the valves seems to be much more stable than in the other group; in *S. giganteum* they are relatively large, in the two Oriental species very small. But in these latter their area though small is not, except in the terga and to a less extent in the carinal latera, reduced by excavation of the margins of the plates, but by a general reduction in size. Such forms as *S. stearnsi* and *S. gruevii* are to some extent

intermediate between these two extremes, being very variable in the extent of the valves, having great or moderately great bulk, a moderately thick capitulum and a moderately thick investment. The reduction of their valves, however, is brought about mainly not by excavation of the margins, and it is possible that they may represent an offshoot from the same stock that has produced *A. giganteum* and *S. persona* successively in the direct line, having valves capable of reduction as in the latter, but lacking the very thick investment and other extreme characters of both species.

In spite of its biological and taxonomic interest the collection does not cast much light on the distribution of the deep-sea fauna of Malaysia. One species (*Scalpellum stearnsi*) appears to be a true eastern form, common in Japanese seas in shallow water and at moderate depths near shore and found by the 'Siboga' at several places in the Malay Archipelago in from 112 to 221 fathoms. It has not been taken anywhere west of the Malay Peninsula. The other seven species have been found only in the Malay Archipelago, but one of them (*Scalpellum persona*) from the Java Sea is closely related to a form (*S. alcockianum*) described from greater depths (859-880 fathoms) off Ceylon. *S. sociabile* is probably confined to the western and central parts of the Archipelago, while *S. nudipes*, *S. sociabile* var. *parviceps*, *Heteralepas gigas*, *H. malaysiana* and *Poecilasma gigas* are only known from the seas round Java and Borneo. None of these species are related to others very closely.

I know of no other collection of barnacles from deep-sea cables in the Malay Archipelago. There is a small one in the British Museum from a cable in the western part of the Indian Ocean, including specimens of three species only, all of which are different from the Malayan ones. It is, however, from a considerably greater depth (1200 fathoms) than the collection considered here. Two of the species (*Scalpellum velutinum*, Hoek and *S. gruelii*, Annandale) are fairly large forms, but the third, *S. (Smilium) acutum*, Hoek, is decidedly small. *S. acutum* and *S. velutinum* are both species with a very extensive range in the deep sea, while *S. gruelii* is known otherwise with certainty only from off Ceylon and from the Laccadive Sea, but is so closely related to American forms from both the Atlantic and the Pacific that their specific identity has been suggested.

Family SCALPELLIDAE.

Genus *Scalpellum*, Leach.

- 1851. *Scalpellum*, Darwin, *Mon. Cirr.*, *Lepadidae* (Ray Soc.), p. 215.
- 1883. *Scalpellum*, Hoek, *Zool. Rep. 'Challenger'*, VIII, *Cirripedia*, p. 59.
- 1905. *Scalpellum*, Gruvel, *Mon. Cirrh.*, p. 23.
- 1907. *Scalpellum*, Hoek, *Siboga-Exp.*, mon. XXXI a (Cirr. Ped.), p. 58.
- 1907. *Scalpellum*, Pilsbry *Bull. U. S. Nat. Mus.*, No. 60, p. 6.
- 1908. *Scalpellum* + *Smilium* + *Euscalpellum*, *id.*, *Proc. Acad. Nat. Sci. Philadelphia*, pp. 107, 108.
- 1910. *Scalpellum*, Annandale, *Rec. Ind. Mus.*, V, p. 145.
- 1916. *Scalpellum*, Joleaud, *Ann. Mus. d'Hist. Nat. Marseilles*, XV, p. 37.

Of the recent species ascribed to this genus by modern authors, now numbering well over a hundred, only six were known to Darwin in 1851 and of these, four had already received separate generic names. The type-species of *Scalpellum* was *S. vulgare*, Leach: 1824 (= *Lepas scalpellum*, Linné: 1767 and Poli: 1795); Gray in 1848 had described a second species under the name *Thaliella ornata*; the same author in 1825 had named a third species *Smilium Peronii*, and a fourth in the same year *Calantica Homii* (= *Pollicipes villosus*, Leach: 1824). All these Darwin included in *Scalpellum*, together with two new species, *S. rutilum* and *S. rostratum*. He was not, however, by any means dogmatic in so doing, for he wrote, "I have felt much doubt in limiting this genus: the six recent species which it contains, differ more from each other than do the species in the previous genera."

Hoek in his report on the 'Challenger' collection (1883) followed Darwin in recognizing only one genus, in which he set up two primary divisions, to include (A) those with imperfectly and (B) those with perfectly calcified valves.

Gravel, in his *Monographie des Cirrhipèdes* (1905), accepted Hoek's classification.

In his account of the Cirripedia in the collection of the United States National Museum (1907) Pilsbry considerably elaborated this system, accepting three subgenera (*Calantica*, *Smilium* and *Scalpellum*) and further subdividing the subgenus *Scalpellum* into three sections, which he called *Scalpellum*, *s. str.*, *Holoscalspellum* and *Neoscalspellum*. He based these subgenera and sections mainly on the number, form and position of the capitular valves of the hermaphrodite or female but also considered the characters of the dwarfed males when these were known.

In the following year, in a paper "On the Classification of the Scalpelliform Barnacles," he carried the process further, laying greater stress on the males, and recognized four genera, *Calantica*, *Smilium*, *Euscalpellum* and *Scalpellum*. *Scalpellum* he subdivided into two subgenera, *Arcoscalspellum* and *Scalpellum*, *s. str.* He also recognized other minor groups.

In the meanwhile (1907) Hoek had published his report on the Cirripedia Pedunculata of the 'Siboga' and had introduced into literature the names *Euscalpellum* and *Arcoscalspellum*, which Hoek adopted from him. These names, however, Hoek used only as those of "Sectiones," together with two others of similar application—*Proto-Scalpellum* and *Meso-Scalpellum*. In all cases he inserted a hyphen and spelt the 'Scalpellum' part of the compound with a capital S. In distinguishing the four sections he gave great importance to the form of the carina, but also considered other valves in the hermaphrodite and female and did not ignore the males.

In 1910 I gave reasons for recognizing only the genus *Scalpellum* with two subgenera, *Smilium* and *Scalpellum*, *s. str.*

Quite recently (1916) Joleaud, writing largely from a palaeontological point of view and ignoring everything but the capitular valves of the hermaphrodites or females, has proposed an entirely new classification. He separates off the apparently more primitive forms assigned to *Scalpellum* by Hoek and places them in the genera *Pollicipes*, which he distinguishes from *Mitella*, and *Scillaelepas*. The remaining species he retains in *Scalpellum*, which he divides into two subgenera. To these he assigns the names *Protoscalpellum* and *Scalpellum*. In *Protoscalpellum* he recognizes three sections, *Euprotoscalpellum*, *Subpseudoscalpellum* and *Pseudoscalpellum*. To *Scalpellum* (*s. str.*) he also assigns three sections, which he calls *Adeuscalpellum*, *Subeuscalpellum* and *Euscalpellum*. To say the least of it, these sectional names are ponderous. Their invention, considering the terminology already available, seems to have laid an unnecessary burden on the ingenuity of the author.

In all of this I see no reason to recede from the position I took up in 1910. at any rate so far as the Indo-Malayan species are concerned. The forms assigned by Joleaud to *Pollicipes* and *Scillaelepas* are certainly very remarkable and may be worthy of subgeneric or even generic rank, but none of them occur in the Indian Ocean and I have little personal experience of any. Of course I do not deny that among the numerous species I retain in *Scalpellum* (*s. str.*) several more or less distinct groups occur, but these groups are not strictly separated one from another and I think it better, when it is necessary to refer to them separately, merely to call them after the most characteristic species known (as "the group of *S. alcockianum*" or "the group of *S. stratum*").

Throughout the Pedunculata valves are liable to degenerate and disappear and I doubt whether the absence of any one valve has much significance. The presence, on the other hand, of more than a definite number is in most genera a fact of importance. In *Scalpellum* (*s. l.*) there may be as many as 15 valves on the capitulum of the hermaphrodite, or as few as 13; but it is significant that in all known males of the genus in which the calcareous armature is not degenerate there are six valves. Moreover, in many if not in all species a stage in the post-larval development of the female or hermaphrodite can be found in which there are six main calcified areas.¹ The six valves that appear on these grounds to be primitive are the carina and rostrum, a pair of terga and a pair of scuta. The primitive armature thus differs from that typical of the Lepadidae mainly in the presence of a rostrum. In *Mitella*, on the other hand, there seems to be no evidence for the existence at any stage in the evolution of the genus of so small a number of valves. As I have pointed out elsewhere,² the lines of evolution in the Cirripedia are so complicated and uncertain that any statement

1. How readily extra valves of no particular significance can be produced in *Scalpellum* is shown by *S. valvulifer*, Annandale, *Vid. Meddel. naturh. Foren. Kbhavn.*, 1910, p. 214, pl. iii, figs. 1, 2.

2. *Mem. Ind. Mus.*, II, p. 64 (1909).

as to the descent of any genus or group of species must be regarded as little more than an expression of individual opinion. I do not deny that a morphological classification would be the ideal one, but when so many doubts exist as to the significance of different structures and organs, convenience is the safest course to follow. It is not convenient to refer to a species as belonging to the genus *Scalpellum*, the subgenus *Proto-scalpellum* and the section *Subpseudoscalpellum*, and though this terminology may convey a definite morphological meaning to its author and his followers, it is merely confusing to the average carcinologist, as well as being technically incorrect.

Subgenus *Smilium*, Gray.

1910. *Smilium*, Annandale, *Rec. Ind. Mus.*, V, p. 150.

Scalpellum nudipes, sp. nov.

(Pl. IV, fig. 1; pl. V, figs. 1-6; pl. VI, figs. 1, 2).

The species is a somewhat isolated one readily distinguished by the vestigial nature and microscopic size of the calcareous valves of its stalk. This character is combined with a fully calcified capitular armature, great bulk and leaf-like anal appendages.

CAPITULUM.

The capitulum is large, ovoid and compressed. There are thirteen large, fully calcified capitular valves in all of which the umbo is apical. They are of a dead white colour and are covered by a thin, smooth, transparent membrane and embedded in a brown cartilaginous investment that separates them slightly. Together they practically cover the surface of the capitulum; none of their apices project strongly. Their surface is smooth, with widely separated obsolescent angulate ridges and furrows. They are all stout and brittle. There are no upper latera.

Terga. The tergum is relatively large, triangular in outline and with all its angles acute. The three angles are situated, one (the umbo) at the apex of the capitulum, one underneath the apex of the scutum on the orificial margin, and one close to the carina and to the posterior angle of the upper latus. The posterior margin of the valve slopes backwards and downwards and is somewhat sinuous but convex outwards as a whole; the anterior margin is straight and relatively short; it is directed downwards and only a very little outwards; the lower margin resembles the upper but with its convexity reversed. The apex is very slightly retroverted.

Scuta. The outline of the scutum somewhat resembles that of the tergum but is relatively shorter and more irregular; the valve is also somewhat smaller. The upper posterior angle is situated immediately above the apex of the upper latus. The apex of the scutum is distinctly retroverted and overlaps the tergum.

Inframedian. The inframedian latus is comparatively large and of broadly triangular form. Its base forms an acute angle anteriorly with that of the carinal latus. The posterior angle dives beneath the carina and is truncate; the anterior angle is somewhat produced below the base of the scutum.

Carinal latera. The carinal latus is also triangular, but more symmetrical, more produced at the anterior and posterior angles and with its base parallel to that of the capitulum and its apex pointing directly upwards between the upper latus and the carina. The base of the valve is buried in the cartilaginous investment but the apex projects outwards almost to the surface.

Rostral latera. The rostral latus resembles the carinal latus in shape and orientation but is even more transverse and is considerably produced backwards, extending for some distance below the base of the latter valve.

Carina. The carina is of moderate size. It extends upwards very little beyond the apex of the scutum and falls far short of that of the tergum. Viewed from the side it is narrow and tapers gradually to the apex; its upper half has a distinct but by no means strong curvature and the apex projects very little behind the posterior margin of the tergum. The base is convex downwards. The dorsum is obscurely carinate and slopes outwards on either side. The base is subangulate and the apex sharply pointed.

Subcarina. The subcarina, which projects almost directly backwards but extends very little behind the carina, is broadly triangular and of comparatively large size. Its apex lies below the middle of the base of the carina and between the posterior angles of the carinal latera.

Rostrum. This valve resembles the subcarina closely but is a little larger and has its apex retroverted below the base of the capitular orifice. It projects hardly at all.

PEDUNCLE.

The peduncle is stout, somewhat compressed and distinctly constricted in the middle. It is of a pale brown colour and a cartilaginous consistency. The surface is wrinkled transversely and divided into small areas, which on the lower part are transverse and rhomboidal, by a network of minute grooves. To the naked eye the capitulum appears to be quite unarmed, but a lens reveals numerous microscopic calcareous particles embedded in the membrane. They have a spindle-shaped or oval outline, are flattened and for the most part directed outwards but do not penetrate the surface. Their position is not correlated with that of the areas on the surface, which are perhaps of artificial origin.

CIRRI, ETC.

1st Cirrus. Both rami are slender and tapering, without dilated segments, the anterior ramus is considerably the shorter of

the two and has about 22 segments. The first cirrus is widely separated from the second.

Cirri 2-6. The remaining cirri are moderately stout and long. Their anterior fringe is well developed though consisting of rather short chaetae; the posterior armature consists of bunches of fine hairs, of which the longest is about equal in length to the segment, attached to the upper extremity of each segment. Except at the extremities of the rami, each segment is ornamented on its anterior half by several sloping, sinuous lines constituted by an internal thickening of the cuticle.

Anal appendages. These are flattened from before backwards and expanded. They consist of a single leaf-like segment devoid of all armature except a very minute and scanty pilosity. The outer margins are strongly concave, the inner a little sinuous. The tips of the appendages do not reach as far as the upper end of the basal segment of the peduncle of the sixth cirri.

Penis. The penis is long, rather broad but compressed laterally, strongly and closely annulate, pointed, armed only with soft fine hairs.

MOUTH-PARTS.

Labrum. The labrum is by no means large and not at all bullate. It has a sharp chitinous edge posteriorly but no teeth. The palps are rather short and stout.

Mandible. The mandible is broad and has a large number of teeth, but, as is usual when it takes this form, is probably variable. In the specimen examined the biting margin is almost straight and bears five main teeth, of which the outermost, the 4th and 5th are subequal and larger than the 2nd and 3rd. Between the 1st and 2nd, 2nd and 3rd and 3rd and 4th there are smaller subsidiary teeth. Of these the first is the largest and the third much the smallest. The inner angle, which projects very little beyond the base of the 5th tooth, is asymmetrical. None of the teeth are pectinate and the whole appendage is practically naked.

Maxilla. This appendage is rather broad. The outer chaeta is very stout and is followed by a rather deep but short quadrate excavation. There is also a small notch on the margin about half way between the excavation and the inner angle. The marginal bristles are numerous and long but delicate. There is a fringe of fine hairs running almost parallel to and at some distance from the margin on the posterior surface of the appendage.

Outer maxillae. The form of these appendages is normal. The sensory organ connected therewith is situated on a rounded papilla.

ACCESSORY MALE.

There are four accessory males attached to the capitulum of the hermaphrodite just below the orifice, but only one of them appears to be mature. It possesses a well differentiated capitulum

armed with 8 valves. The number of valves is, however, probably abnormal as it is brought about by the separation, quite asymmetrically, of two small plates, one on either side of the carina a little above its base. The normal number is, as in allied forms, probably 6. The capitulum is about as broad above as it is high, it is much broader than the peduncle and moderately compressed from side to side. The orifice opens upwards and outwards.

The six valves are stout and of comparatively large size. The terga are much smaller than the others and have an almond-shaped outline. Their main axis is vertical. The scuta are broadly triangular and much wider than the other valves: their apices are pointed and turned backwards slightly. The rostrum is large, relatively narrow, very prominent but somewhat retroverted at the apex. The carina is narrow, curved, pointed above and subtruncate at the base. The apices of this valve, of the terga and of the scuta are almost on a level. The appendages are relatively shorter than in the hermaphrodite but otherwise similar. They lack the peculiar ornamentation characteristic of the larger sex but are armed similarly. The mouth-parts are well developed and also resemble those of the hermaphrodite, except that the labrum is relatively smaller and the mandibles have fewer teeth. The anal appendages are leaf-like and consist of a single segment: there is a small bunch of long hairs at their free extremity. The penis is not annulated.

The younger males have a much narrower capitulum of oval outline. The rostrum and carina are considerably smaller and not at all prominent, while the other valves are less regular in shape. The vesicula seminalis, a conspicuous feature of the large male, is barely visible in the smaller individuals.

MEASUREMENTS.

	Hermaphrodite (<i>type</i>)	Adult Male	Young Male
Height of capitulum	55 mm.	4.5 mm.	2.5 mm.
Width of capitulum	40 „	4.5 „	2.0 „
Thickness of capitulum	20 „	—	—
Length of peduncle	56 „	2.8 „	1.5 „
Diameters of peduncle	25 x 18 „	—	—

Type-specimen. Crustacea, 9319/10, Z. S. I. (Ind. Mus.).

Locality. Lat. 10° 22' 30" (?S), long. 120° 7' 30" E. (130-500 fathom), Java Sea.

This species, taking both the hermaphrodite and the male into consideration, would find a place in the genus *Calantica* as redefined by Pilsbry in 1908, but is not at all allied to *S. villosum* (Leach), the type of that genus. Nor is it related to the North Atlantic forms assigned by Pilsbry to the group *Scillaelepas*. In spite of the absence of an upper latus in the hermaphrodite it seems to me to be probably related to such forms as *Scalpellum stratum*.

Aurivillius, from the West Indies and *S. sinense*, Annandale, from the seas of Burma and China. It is, in any case, an extremely distinct species, remarkable for its large size, almost naked peduncle and curious anal appendages. The regularity of the valves of the hermaphrodite is a noteworthy feature and the comparatively large size and high development of the male another.

I have examined only the type-specimen, but there is, I think, another from the same locality in the Raffles Museum.

Subgenus *Scalpellum*, Leach.

1910. *Scalpellum* (s. s.), Annandale, *Rec. Ind. Mus.*, V, p. 150.

1913. *Scalpellum* (s. s.), *id.*, *ibid.*, IX, p. 227.

Scalpellum hamulus, Hoek.

1907. *Scalpellum hamulus*, Hoek, *Siboga-Exp.*, mon. XXXI a (Cirr. Ped.), p. 86, pl. vii, figs. 14, 14a.

I assign to this species two comparatively large specimens from Johul Bank 90 miles south of Timor (70 fathoms). They were attached to the cable in the midst of a massive Alcyonarian of the genus *Dendronephthya*. The capitulum in one specimen is 36 mm. long by 22 mm. broad, the peduncle 37 mm. by 11 mm. The valves are tinged with pink, especially at the apices. The only difference from Hoek's figure that I can detect is that all the lower latera are relatively a little larger, the carina distinctly longer and the upper margin of the tergum less sinuate above. The two last characters are probably correlated.

The cirri of this species are extremely slender and the hairs on their anterior margin very delicate. The basal segment of the anal appendages is expanded and flattened, but much less so than in *S. sociabile*; it bears a long flagellum-like process with about sixteen segments, the exact number, as in *S. sociabile*, being probably variable.

Scalpellum sociabile, Annandale.

1905. *Scalpellum sociabile*, Annandale, *Mem. As. Soc. Bengal*, I, p. 77, pl. viii, fig. 1.

1908. *Scalpellum sociabile*, *id.* III. *Zool. 'Investigator'*, *Entomotraca*, pl. iii, fig. 9.

The typical form, which is well represented in Capt. Worsley's collection, is more variable (in particular as to the mouth-parts and the number of segments in the anal appendages) than I realized when drawing up the original description. Indeed, the mandibles of the specimen then dissected seem to have been altogether abnormal (*op. cit.*, 1905, p. 78, fig. 2). A characteristic feature of the appendage is, however, shown even in the abnormal specimen, namely the great distance between the first and second tooth and the strong sinuosity or irregular outline of the margin between these two teeth (*cf.* pl. vi, fig. 6). The form of the anal appendages,

with their large and greatly expanded basal segment and short cylindrical flagellum, is also most characteristic, though the number of segments in the flagellum is variable.

The characteristic features of the typical form are, as distinguishing it from both the two varieties discussed below, its comparatively narrow and compressed capitulum, the large size of the calcareous plates on the upper part of the peduncle and the relatively considerable, though not excessive size of the peduncle.

The type-specimens in the Indian Museum are from Bali Straits (160 fathoms), while the examples in the Raffles Museum are labelled, lat. $10^{\circ} 22' 30''$ (S.?), long. $120^{\circ} 7' 30''$ E., 130-500 fathoms. The latter do not exhibit the extreme gregariousness of those figured in 1905.

var. *pellicatum*, Hoek.

1907. *Scalpellum pellicatum*, Hoek, *Siboga-Exp.*, mon. XXXI a (*Cirr. Ped.*), p. 91, pl. vii, figs. 18, 19.
 1909. *Scalpellum sociabile* var. *pellicatum*, Annandale, *Rec. Ind. Mus.*, III, p. 270.

Hoek recognized the close relationship of this form to my species, which was described while his 'Siboga' report was in the press, but left it to future investigators to ascertain the precise connection. In view of the variations seen in the large series of *S. sociabile* I have now examined, I am convinced that *S. pellicatum* is no more than a variety of that species. The curious hook on the upper margin of the capitulum, due to the fact that the apex of the carina is entirely free from the capitular membrane, is perhaps abnormal, but the form differs otherwise from the *forma typica* in its relatively broad capitulum and short peduncle armed with close-set plates.

The specimens dredged by the 'Siboga' (the only examples known) were taken in the Celebes Sea and east of Halmaheira in depths of 450 and 397 metres. They were probably all attached to sea-urchins. I have not examined specimens.

var. *parviceps*, nov.

(Pl. IV, fig. 2; pl. V, fig. 9; pl. VI, fig. 6).

This variety differs from the typical form mainly in its very large peduncle, which is armed with relatively small, widely-separated plates, in the strong development of the hairy capitular epidermis and of the membrane in which the valves are buried. The capitulum is also stouter and more quadrate and the valves are relatively a little smaller. I figure the type specimen and also its mandible and anal appendage.

The measurements of the type-specimen are as follows. It is

numbered 9318/10, Crustacea in the books of the Zoological Survey of India. There is a cotype in the Raffles Museum.

Height of capitulum	35 mm.
Breadth of capitulum	25 „
Length of peduncle	53 „
Diameter of peduncle	17 „

The two specimens were taken in lat. $10^{\circ} 22' 30''$ (?S), long. $120^{\circ} 7' 30''$ E. (130-500 fathoms) in the Java Sea. They were attached side by side to the cable.

The differences in the three varieties of this species may perhaps be correlated with differences in environment. The specimens of the typical form were found attached to a telegraph cable or to one another and those of var. *pellicatum* probably to the spines of sea-urchins. In the first instance there was obvious opportunity for free growth and rapid reproduction, in the second the short peduncle may have been of advantage in permitting the guests to lie closer to their host and so to receive full protection from its spines; but I am unable to suggest an explanation of the long peduncle and thick investment of the var. *parviceps*.

Scalpellum stearnsi, Pilsbry.

- ? 1851. *Scalpellum magnum*, Darwin, *Mon. Fossil Lepadidae*, p. 18, pl. i, fig. 1.
 1890. *Scalpellum Stearnsi*, Pilsbry, *Proc. Acad. Nat. Sci. Philadelphia*, p. 441, fig.
 1891. *Scalpellum calcariferum*, Fischer, *Bull. Soc. Zool. France*, XVI, p. 116, fig.
 1905. *Scalpellum inerme*, Annandale, *Mem. As. Soc. Bengal*, I, p. 75, pl. viii, figs. 1, 2.
 1907. *Scalpellum stearnsi* varr. *robusta* and *gemina*, Hoek, *Siboga-Exp. mon.* XXXI a (*Cirripedia Pedunculata*), p. 69, pl. vi, figs. 1-12.
 1907. *Scalpellum stearnsi* and *S. inerme*, Pilsbry, *Bull. U. S. Nat. Mus.*, No. 60, p. 14.
 1909. *Scalpellum stearnsi*, Annandale, *Rec. Ind. Mus.*, III, p. 270.
 1907. *Scalpellum stearnsii*, Krüger, *Abh. K. Bayer. Ak. Wiss.*, Suppl.-Bd. II, p. 18, pl. ii, figs. 18, 19.

I have already pointed out (*op. cit.*, 1909) the close resemblance between recent examples of this species and Darwin's figure of the fossil *S. magnum*¹ of the Coralline Crag of Sudbourne. Apart from possible anatomical differences, which of course cannot be discussed, I would have no hesitation in regarding the fossil and the recent form as specifically identical.

Scalpellum stearnsi was described under that name by Pilsbry in 1890 and redescribed as *S. calcariferum* by Fischer in the following year. In 1905 I described *S. inerme*, which I now believe to be merely an extreme form of the species, without recognizing its true

1. This resemblance was first noticed by Fischer in 1891, *op. cit.*, p. 118.

relationship. My attention was first drawn to the close affinities of the two forms by the Rev. T. R. R. Stebbing, F. R. S. Two years later Hoek referred specimens from the Malay Archipelago to two new varieties, which he called *robusta* and *gemina*. The type of *S. inerme* differs from one of his specimens of the variety *gemina* hardly more than these specimens vary among themselves. Hoek's Malayan examples differ considerably from those hitherto described from Japan, in particular in the great development of the peduncle and the capitular investment. I have, however, been able to examine a good series both from Japan and from the Malay Archipelago and cannot find any distinct break either between specimens from different localities or between those of the supposed varieties.

There are in the Indian Museum four specimens from Japan. Two of these, which were received in exchange from the British Museum, are comparatively small, the capitulum of the larger example being only about 25 mm. in length. They agree sufficiently well with Pilsbry's and Fischer's figures and differ little, apart from size, from the young specimen of the variety *robusta* figured by Hoek, except that all the prominent valves are a little more pointed. I recently obtained in Japan two very large specimens which have the following measurements:—

	A	B
Height of capitulum	63 mm.	55 mm.
Breadth of capitulum	43 „	35 „
Thickness of capitulum	26 „	22 „
Length of peduncle	62 „	49 „
Diameter of peduncle	25 „	22 „

In measuring the breadth of the capitulum I have not included the prominent part of the carinal latera; I have measured the thickness of the capitulum at the base.

These two specimens, which were taken side by side, agree much more closely with the description and figures of the variety *robusta* than they do with those of the typical form. The investment of their capitulum is thick and semi-opaque and their peduncles, though less swollen than those of the type of *robusta*, are very nearly as long. I do not think, therefore, that the Japanese form can be regarded as a local race of the Malayan one and I see no reason for giving the latter a distinct name, so far as well calcified examples are concerned.

My supposed species *inerme* differs from the typical form and from *robusta* merely in the rather shorter peduncle and in the extreme degeneration of the capitular valves, for the anatomical differences noted by Pilsbry are certainly not beyond the limits of variation. In respect to the degeneration of the valves it is merely an extreme form of Hoek's form *gemina*, one of the co-types of which is now in the Indian Museum. There is in the Raffles

Museum a fairly large series from the Malay Archipelago, and the series includes a number of individuals intermediate between the forms *robusta* and *gemina*. I am doubtful, therefore, whether distinct varieties based on the development of the valves should be recognized in the species, but if it is considered desirable to refer to the form with degenerate valves by a distinct name, they should clearly be called var. *inermis*. Some justification may be found for this course in the apparent absence from Japanese seas of individuals with degenerate valves.

S. stearnsi was originally described from shallow water (6-10 fathoms), on the east coast of Japan. The type was attached to a *Vermetus* shell. The type of *S. calcariferum* was from Enoshima in Sagami Bay. My own Japanese specimens are also from Sagami Bay, but probably came from rather deeper water, as Pilsbry's (*op. cit.*, 1907) from off Hondo certainly did. The latter were taken in 94 fathoms. Mine were attached to a dead shell of *Xenophora*, which was mined by the sponge¹ *Cliona vastifica* v. *concharum*, Thiele. Hoek's specimens were from the Sulu Archipelago and the Sulu Sea: they came from depths of from 204 to 495 metres. The types of *gemina* were taken at the latter depth, but no examples of the var. *robusta* were found in depths greater than 330 metres. The specimens in the Raffles Museum are from the Java Sea, from depths of between 130 and 500 fathoms, while the type of *S. inermis* was from Bali Straits (160 fms.). Hoek's specimens were attached to shells or (the types of *gemina*) to the anchor-filaments of a Hexactinellid sponge: all of those from Malaysia in the Raffles and the Indian Museum were fixed to telegraph cables.

It is possible that large size and a strong development of the capitular investment are correlated in this species with life in comparatively deep water, but I have not found this to be the case in the European *S. vulgare*, in which somewhat similar, but not so extreme, variation occurs so far as the calcification of the capitulum is concerned.

Scalpellum persona, sp. nov.

(Pl. IV, fig. 3; pl. V, figs. 7, 8; pl. VI, figs. 3-5).

This species belongs to a little group of large *Scalpella* of doubtful affinities and remarkable for the great development of the capitular investment, in which the valves are buried and almost completely hidden. The valves themselves are more or less reduced

1. Pearl-oyster shells from shallow water in Sagami Bay are attacked by a form of the same sponge much more closely resembling the *forma typica*. The upper surface of the *Xenophora* shell, round the base of the barnacles, was almost completely covered by a thick crust of another sponge, *Gellius glacialis* v. *niveus*, Ridley and Dendy, which I do not think has hitherto been recorded from Japan. The apertures of the mining species were mostly on the lower surface of the shell, which was rather deeply concave owing to breakage. It would seem to have been lying free on the bottom.

in size but their margins, except in the terga and to some extent the carinal latera, are not excavated.

CAPITULUM.

The capitulum is ovoid, of large size and considerably inflated. The valves are completely concealed (except, in some cases, for the apices of the terga, carina and latera) in a thick, opaque, brownish, cartilaginous investment, the surface of which is glabrous and almost smooth. There are eleven relatively well developed valves in addition to a vestigial rostrum. Even those that are relatively well developed are actually of small size and they occupy together only a small proportion of the capitular area. They have, however, an opaque white colour and are fairly thick. Their umbones are apical. There is no subcarina.

Terga. The tergum is much reduced and has the form of a four-pointed star with two of its rays greatly and two slightly produced. The two long rays extend downwards, one reaching the tip of the scutum, the other a point about midway between the upper latus and the carina; one of the short rays is directed upwards and forms the tip of the capitulum, while the other points backwards and downwards. Both the long rays are strongly ridged.

Scuta. The scutum, though of small size and widely separated from all other valves but the tergum, is of normal form and has none of its margins excavated or deeply concave. It constitutes a triangle with a broad base and acutely pointed apex. The base lies parallel to that of the capitulum. The anterior margin of the valve is convex forwards, the posterior margin slightly concave and the basal margin nearly straight. The apex slightly overlaps the lower margin of the tergum.

Upper latera. The upper latus is small, triangular, non-emarginate. It is widely separated from all the other valves. Its larger axis occupies a line running from the apex of the scutum to the upper angle of the carinal latus. The antero-superior part of the valve is carinate.

Inframedian latera. These valves are almost vestigial, consisting of minute triangular plates deeply embedded in the investment. They are situated immediately below the upper latera and nearer the rostral latera than any other valve.

Rostral latera. The rostral latus is transverse, elongate and band-shaped. The two valves meet below the orifice. Their inner angles are immediately below those of the scuta.

Carinal latera. The carinal latera project strongly behind the capitulum some distance below the base of the carina. Their bases, however, lie deeply buried. Their apices are very slightly turned upwards.

Rostrum. The rostrum is vestigial and concealed behind the rostral latera.

Carina. The carina is reduced in size. Above it extends nearly to the apex of the capitulum, but below falls far short of the base. Its apex approaches that of the terga; otherwise it is widely separated from the other valves. In lateral view it is almost linear, strongly curved in its upper third and with its umbo strictly terminal. The dorsum, which is deeply buried, is narrow and feebly convex; the base is subangulate.

PEDUNCLE.

The peduncle is cylindrical and of about the same length as the capitulum. It is armed with distinct circles of large, projecting alternate plates more or less completely covered by a cartilaginous investment. They are much compressed from above downwards and their exposed margin is angulate or sub-angulate.

CIRRI, ETC.

1st Cirrus short and rather stout, the two rami subequal, the central segments of the anterior ramus expanded and produced backwards, the inner surface of both densely covered with hairs.

Cirri 2-6 not far removed from 1st cirrus, slender, armed anteriorly with two rows of long stiff but slender chaetae and posteriorly with terminal bunches of slender hairs, the largest of which are a little longer than the segment to which they are attached. Each bunch proceeds for a short distance down the back of the segment; those of the 6th cirri are feebly developed.

Anal appendages long, slender and tapering, consisting of a large number of segments, but much shorter than in *S. alcockianum*. The basal joint much the longest and somewhat expanded and flattened from before backwards.

Penis. Rather short, smooth, slender and pointed.

MOUTH PARTS.

Labrum. Small, not at all bullate; labial palp slender, pointed.

Mandible. Rather small, variable in dentition, but with three main teeth in addition to the inner angle, which is variously divided and broad as a whole; the outer tooth remote from and larger than the 2nd and 3rd, which are equal and situated rather close together.

Maxillae. Relatively large, with a broad shallow excavation on its upper margin occupying more than half the margin, the remainder of which is obliquely subtruncate. The two outer spines very stout but not lengthy.

Outer maxilla remarkable for the great development of the olfactory organ, which takes the form of a blunt conical process about half as long as the appendage is broad.

Family LEPADIDAE.

1909. Lepadidae, Annandale, *Mem. Ind. Mus.*, II, p. 64.

R. A. Soc., No. 74, 1916.

Subfamily LEPADINAE.

1909. Lepadinae, *id.*, *ibid.*, p. 71.Genus *Heteralepas*, Pilsbry.1907. *Heteralepas*, Pilsbry, *Bull. U. S. Nat. Mus.*, No. 60, p. 100.1909. *Heteralepas*, Annandale, *Mem. Ind. Mus.*, II, p. 83.Subgenus *Heteralepas*, Pilsbry.*Heteralepas gigas* (Annandale).1905. *Alepa gigas*, Annandale, *Mem. As. Soc. Bengal*, I, p. 80, pl. viii, fig. 3.

The type-specimen was taken by Capt. Worsley in Bali Straits on a cable at a depth of 160 fathoms. There are numerous specimens from the Java Sea (lat. $10^{\circ} 22' 30''$ (?S.), long. $120^{\circ} 7' 30''$ E.: 130-500 fathoms) in the Raffles Museum. The latter are considerably more swollen and distorted than the former and show that the animal must have had a gelatinous appearance in life much like that of the *Alepa* found attached to medusae on the surface. The hairs I described on the external surface of the type do not belong to the animal but are the remains of a Hydroid attached to it. I reproduce a photograph of a specimen from the Java Sea.

The type-specimens of *Poecilasma* (*Glyptelasma*) *gigas* were found attached to the peduncle of examples of this species.

Subgenus *Paralepas*, Pilsbry.1907. *Paralepas*, Pilsbry, *op. cit.*, p. 100.*Heteralepas malaysiana* (Annandale).1905. *Alepa malaysiana*, Annandale, *Mem. As. Soc. Bengal*, I, p. 81, pl. viii, fig. 4.1909. *Heteralepas malayana* (*lapsu*), Annandale, *Mem. Ind. Mus.*, II, p. 130.

Subfamily POECILASMATINAE.

Genus *Poecilasma*, Darwin.1851. *Poecilasma*, Darwin, *Mon. Cirr.*, *Lepadidae*, p. 99.1907. *Poecilasma* and *Glyptelasma*, Pilsbry, *Bull. U. S. Nat. Mus.*, No. 60, pp. 82, 87.1907. *Megalasma* (in part). *id.*, *Proc. Acad. Nat. Sci. Philadelphia*, p. 415.1909. *Poecilasma*, Annandale, *Mem. Ind. Mus.*, II, p. 90.Subgenus *Glyptelasma*, Pilsbry.

This subgenus only differs from that which contains the typical forms of *Poecilasma* in the peculiar structure of the base of the carina. Pilsbry regards it as intermediate between *Poecilasma* and *Megalasma* and as probably ancestral to the latter, under which he places it. The species now to be described, however, though it evidently comes into the subgenus is in most respects a true *Poe-*

cilasma and I think that Pilsbry's *Glyptelasma* has on the whole greater affinity with Darwin's genus than with Hoek's *Megalasma*, in which the umbo of the scuta has undergone a peculiar rotation.

***Poecilasma gigas*, sp. nov.**

(Pl. IV, fig. 4; pl. V, figs. 10-14, pl. VI, figs. 7, 8).

This is one of the largest species as yet known either in *Poecilasma* or in *Megalasma*. It has also a longer peduncle than is usual in either *Megalasma* or *Glyptelasma*, both of which usually differ in their very short peduncle from the more *Lepas*-like *Poecilasma* (*s. str.*). The form of the base of the carina is characteristic of the species.

CAPITULUM.

The capitulum is large, rather narrow, strongly compressed in the tergal and carinal regions and only moderately inflated in the scutal. In form it is nearly rectangular, but rendered asymmetrical by the strong backward slope of the upper margin. The valves are nearly smooth, white and opaque; they are separated by lines of membrane and covered with a rather thick brownish cuticle, which is usually torn.

Terga. The terga are broad but have comparatively little vertical depth. They are rendered quadrangular by the fact that the posterior angle is distinctly truncated by the apex of the carina. The backward slope of the valve is well marked, its margins are all straight and its apex though not retroverted forms a very acute angle. The ocludent margin almost forms an angle with that of the scutum, being directed backwards as well as upwards. There is a well-developed triannular tooth at the outer end of the lower margin on the inner surface of the left valve, but none on the right valve.

Scuta. The scuta are large, quadrangular in outline, moderately inflated in their basal parts, and symmetrical externally. The carinal margin is arched, the others almost straight. The ocludent margin is, however, a little rounded below and the basal margin, which is the shortest of the four, slightly concave. The umbo is slightly introverted. The ocludent margin is much the longest. There is a well-marked groove running along the basal margin above the edge. The right valve bears a blunt tooth on the inner surface at the basal ocludent angle. This tooth fits into the concave surface of a short process in the corresponding position on the other valve.

Carina. The carina is of normal length. Seen from the side it is strongly arched and narrow, especially above, but bears at the base two short transverse processes with blunted extremities that impinge on the inner ends of the basal grooves on the scuta. Seen from behind the valve is quite flat in its upper half but strongly carinate towards the base, at which the carina terminates in a sharp,

slightly introverted point; the apex is subangulate and a little expanded. The transverse basal processes are strongly carinate, their carinae meeting that of the dorsum at a right angle but not extending so far outwards towards the surface of the capitulum. The inner surface of the carina is flat above; below it is deeply but narrowly grooved. The basal floor is slightly concave inwards and terminates at either side in a blunt tubercle.

PEDUNCLE.

The peduncle is slender and cylindrical, sometimes nearly as long as the carina. In the specimens examined it is much wrinkled, but this condition is probably artificial. It is quite naked.

CIRRI, ETC.

1st Cirrus short, slender, with the basal segments of both rami very long; the anterior ramus a little longer than the posterior; both rami somewhat bluntly pointed.

2nd-6th Cirri slender, rather short, with the anterior bristles numerous and well-developed, long and rather stout, the posterior hairs forming short transverse bands across the posterior surface of the tips of the segments; some of these hairs on some segments longer than the segment, but the majority distinctly shorter.

Anal appendages short, conical, having on the upper part of the opposed surfaces a small, ovoid, flattened squamose area; a scanty vertical row of bristles borne on the upper part of this area and extending over the tip of the appendage; the bristles of variable length but the apical one much the longest.

Penis long, slender, smooth; the tip rather blunt, bearing a dense bunch of soft hairs.

MOUTH-PARTS.

Labrum short, triangular, armed at its base with a semicircular row of minute conical teeth; the teeth in the middle part of the row much smaller than those in the outer parts. Labral palps short and rather stout.

Mandibles evidently very variable, with a considerable number of teeth, narrow and long.

Maxillae broad; the only chaetae of large size at the outer angle; a well-marked excavation occupying nearly one-half of the margin, the inner lobe of which is broadly rounded; a few short bristles present at the base of the excavation; no stout chaetae on the lower part of the margin.

Outer maxilla of normal type.

MEASUREMENT OF TYPE.

Height of capitulum	..	..	24 mm.
Breadth of capitulum	..	..	13 "
Thickness of capitulum	..	..	6.5 "
Length of peduncle	..	..	12 "
Diameters of peduncle	..	..	6 x 4 "

Type-specimen. Crustacea, 9322/10, Zoological Survey of India (Ind. Mus.)

Locality. 10° 22' 30" (?S.), long. 120° 7' 30" E. (130-500 fathoms).

The species is an isolated one, intermediate between the genus *Megalasma*, Hoek, which it resembles in the structure of its carina, and *Poecilasma*, Darwin, with which it agrees in other points. On the whole it seems to be most nearly related to *P. kaempferi*, Darwin, a Japanese species with local races in many seas. It is easily distinguished, however, from all of these by its large size and by the form of its carina.

The type-specimens were attached to the peduncle of *Heteralepas gigas*: a considerable number of specimens were found thus associated with a group of that species from a telegraph cable. Other, smaller examples were fixed to the capitulum of the type of *Scalpellum nudipes* from the same locality.

Description of Plate IV.

- Fig. 1.—Type-specimen of *Scalpellum (Smilium) nudipes*, sp. nov., with young specimens of *Poecilasma (Glyptelasma) gigas* attached to its scuta.
- Fig. 2.—Type-specimen of *Scalpellum sociabile* var. *parviceps*, var. nov.
- Fig. 3.—Type-specimen of *Scalpellum persona*, sp. nov.
- Fig. 4.—Type-specimen of *Poecilasma (Glyptelasma) gigas*, sp. nov.
- Fig. 5.—Specimen of *Heteralepas gigas* (Annandale) from the Java Sea.

All the figures are of the natural size.

Description of Plate V.

Scalpellum nudipes, sp. nov.

- Fig. 1.—Part of 4th cirrus (greatly enlarged).
- Fig. 2.—Body from behind, showing anal appendages and base of 6th cirrus (x 4).
- Fig. 3.—First cirrus (x 2).
- Fig. 4.—Mouth-parts in lateral view (x 4).
- Fig. 5.—Immature male (x 8).
- Fig. 6.—Capitulum of adult male (x 8).

Scalpellum persona, sp. nov.

Fig. 7.—Outline of capitulum and capitular valves (reduced).

Fig. 8.—Dorsal view of anal appendage (x 10).

Scalpellum sociabile var. *parviceps*, var. nov.

Fig. 9.—Right anal appendage as seen from behind (x 15).

Poecilasma gigas, sp. nov.

Fig. 10.—Lateral teeth and right lateral palp as seen from in front (x 75).

Fig. 11.—Part of fifth cirrus (greatly enlarged).

Fig. 12.—Oblique internal view of anal appendage (x 15).

Fig. 13.—Base of carina and right scutum in lateral view (x 3).

Fig. 14.—Internal view of base of carina (x 8).

Description of Plate VI.*Scalpellum nudipes*, sp. nov.

Fig. 1.—Mandible (x 10.66).

Fig. 2.—Maxilla (x 10.66).

Scalpellum persona, sp. nov.

Figs. 3, 3a.—Mandibles of type (x 12).

Fig. 4.—Maxilla (x 12).

Fig. 5.—Outer maxilla (x 20).

Scalpellum sociabile var. *parviceps*, var. nov.

Fig. 6.—Mandible of type (x 6.66).

Poecilasma gigas, sp. nov.

Figs. 7, 7a.—Mandibles of type (x 20).

Fig. 8.—Maxilla (x 20).



1.



2.



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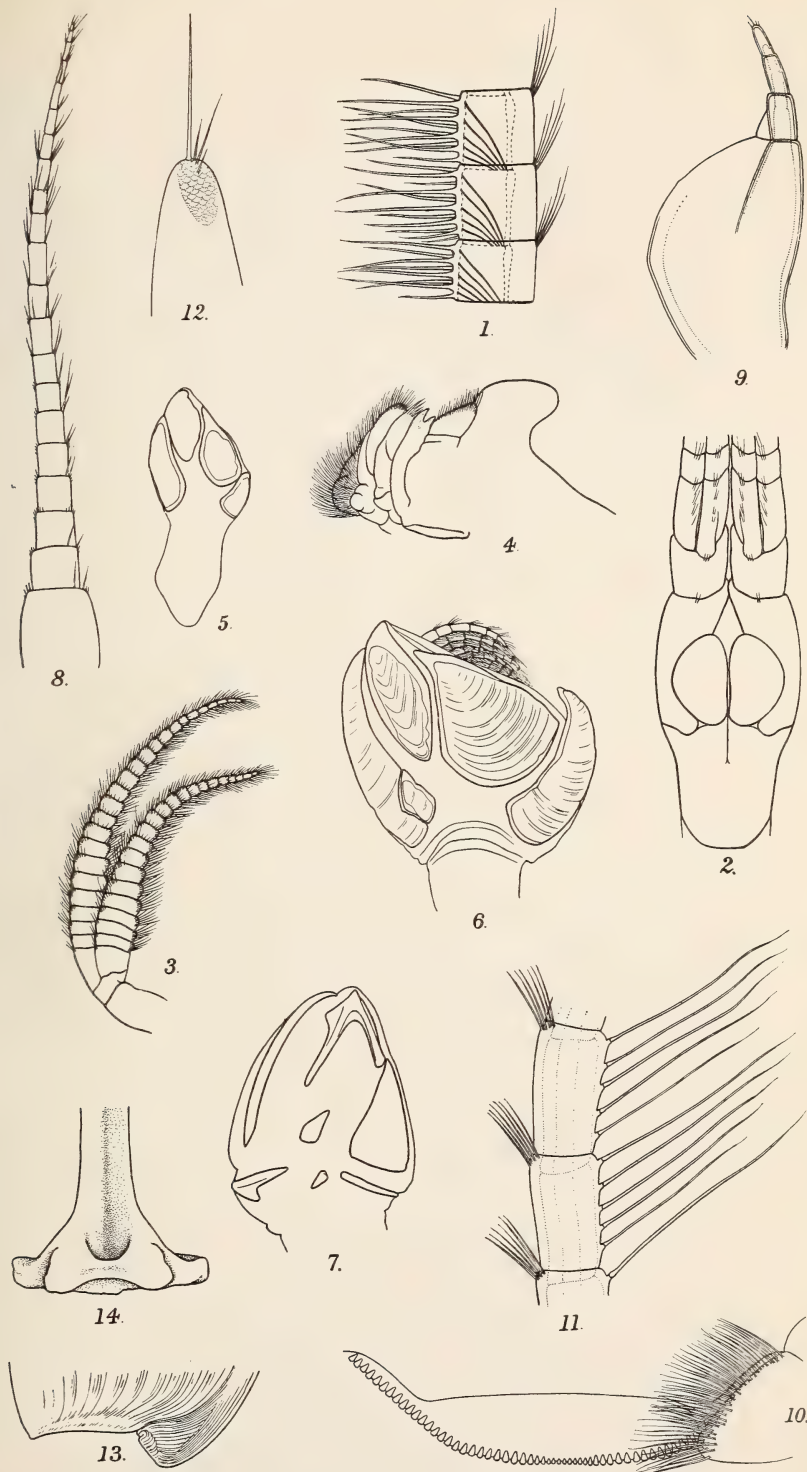
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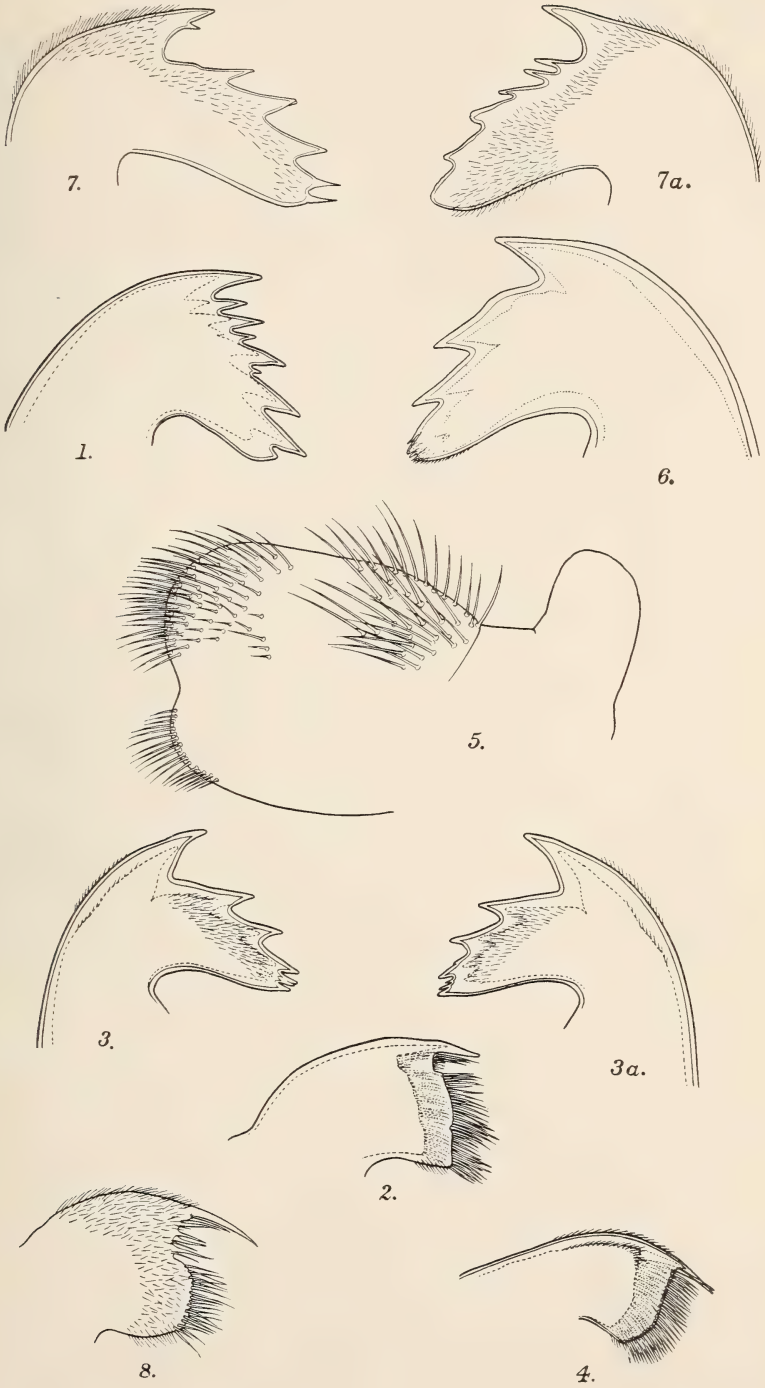
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S.C.Mondul, Photo.

Photo@venture...Survey of India Office, Calcutta, 1916.



S. C. Mondul, & D. N. Bagchi, *del.*



S. C. Mondul, & D. N. Bagchi, *del.*

MALAYAN DEEP-SEA CIRRIPEDIA.